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Fig 1

Fig 2

Fig 3

Fig 4

Fig 5

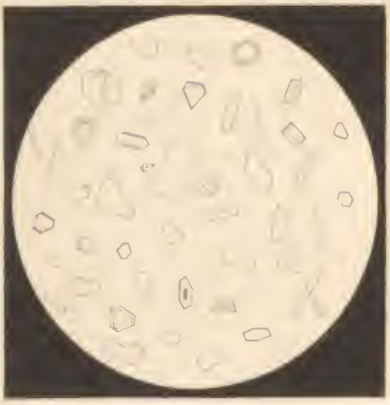

Fig 6

THE

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A CONTRIBUTION TO OUR KNOWLEDGE OF THE CHEMICAL COMPOSITION OF GELSEMIUM SEMPERVIRENS.

Case of fatal poisoning by three drachms of the fluid extract, and recovery of the poison some months after death.

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Having recently been solicited to make a chemical examination of the contents of the stomach of a woman who, it was claimed, had administered to her, through the mistake of a druggist, a quantity of the fluid extract of gelsemium* and died from its effects, we found it necessary, before undertaking the examination, to ascertain whether this substance really contained any principle or principles by which its presence could be certainly determined. For this purpose, we made a series of experiments upon the fluid extract of gelsemium, prepared by Tilden & Co., and found it to contain a new organic acid, which may be denominated *gelseminic acid*, and a strongly basic or

EXPLANATIONS OF THE PLATE

Illustrating Dr. Wormley's paper on Gelsemium sempervirens.

Fig. 1. Gelseminic acid from ethereal solution, × 20 diameters.

" 2. " " hot supersaturated aqueous solution, × 75 diameters.

" 3, 4, 5. Gelseminic acid, sublimed, × 75 diameters.

" 6. Gelseminic acid, precipitated by corrosive sublimate, × 75 diameters.

* A concentrated tincture of the root of Gelsemium of the strength of 480 grains to each fluidounce.—Editor.

alkaloidal principle, which, being the active principle of the drug, may be named *gelseminine*, *gelseminia* or *gelsemia*.

It has been known for some years that this drug contained a very active poisonous principle, but, so far as we are aware, the only published accounts relating to its chemical properties are the two heretofore published in this Journal: the first by H. Kollock, May 1855, p. 197, and the other by C. L. Eberle, January, 1869, p. 35. Neither of these experimentalists, however, satisfactorily succeeded in isolating and ascertaining the chemical properties of this principle.

Before entering into the details of the above case of poisoning, the methods by which the new acid and base may be obtained, together with their respective chemical properties, will be pointed out.

I. Gelseminic Acid.

Preparation.—Gelseminic acid may be obtained from the fluid extract of gelsemium by the following method: Concentrate the fluid extract on a water-bath to about one-eighth of its volume, then add to the concentrated extract several times its volume of pure water and allow the mixture to stand several hours, or at least until the supernatant liquid has become very nearly or altogether clear. By this treatment most of the resinous matter, held in solution by the alcohol originally present, will be separated. The mixture is then transferred to a filter, the solids well washed with water, and the filtrate thus obtained, together with the washings, concentrated on a water-bath to about the same volume the concentrated extract had prior to the addition of the pure water. The concentrated liquid, after filtration, if necessary, is acidulated with hydrochloric acid in the proportion of one drop of the pure acid for each fluid ounce of the fluid extract operated upon, then thoroughly agitated with about twice its volume of ether; after the liquids have completely separated, the ethereal fluid is decanted and the aqueous solution again agitated with a similar quantity of ether, which in its turn is decanted and the aqueous liquid finally washed with about its own volume of ether.

On allowing the united ethereal liquids thus obtained to evapo-

rate spontaneously, the gelseminic acid will be left chiefly in the form of nearly colorless groups of crystals, of the forms illustrated in plate, fig. 1, together with more or less yellowish or brownish resinous matter. The crystals may be washed with a small quantity of cold absolute alcohol, which will readily dissolve the adhering coloring matter without acting much upon the crystals themselves. The alcohol thus employed may be evaporated spontaneously, when a second crop of crystals will be obtained; these are also washed with alcohol and added to the former crystals. To further purify the crystals, they are diffused in a small quantity of hot water and extracted from the cooled mixture by chloroform, which on spontaneous evaporation will leave them very nearly or altogether colorless.

To recover and purify the gelseminic acid taken up and held in solution by the alcohol employed to wash the above crystals, the liquid is evaporated to dryness and the residue treated with a small quantity of water, and sufficient caustic potash added to just neutralize the liquid, by which the organic acid will be dissolved in the form of a salt of the alkali. This solution is filtered, the filtrate treated with slight excess of basic acetate of lead, and the precipitate, consisting of the gelseminate of lead, collected on a filter and washed. The washed residue is diffused in an appropriate quantity of water and treated with excess of sulphuretted hydrogen gas, which will decompose the lead-salt with the precipitation of the metal as sulphuret and the elimination of the organic acid. This mixture is heated to about the boiling temperature, to dissolve the organic acid, and filtered while still hot, and the residue washed with a little alcohol, which is collected with the first filtrate. The filtrate may now be concentrated and the organic acid extracted by chloroform, which on spontaneous evaporation will leave it in its crystalline state.

As the average of several experiments, after the above method, sixteen ounces of the fluid extract of gelsemium yielded about two grains and a quarter of pure gelseminic acid.

Chemical Properties.—In its pure state, gelseminic acid is a colorless, odorless, nearly tasteless solid, which is readily crystallizable, usually forming groups or tufts of delicate needles. It

has strongly acid properties, completely neutralising bases and uniting with them to form salts, most of which, excepting those of the alkalies, are at most only sparingly soluble in water. The salts of the acid having an alkaline base, are very freely soluble in water and are crystallisable. The pure acid is freely soluble both in chloroform and in ether, but only sparingly soluble in water, requiring about one thousand times its weight of this liquid for solution. It is much more freely soluble in hot water, from which, however, the excess immediately begins to separate, in the form of long slender needles, as the solution cools. Plate, fig. 2.

If a small quantity of gelseminic acid, or of any of its salts in the solid state, be treated with a drop of concentrated *nitric acid*, it dissolves under a yellow coloration to a yellow, reddish or red solution, the final color depending upon the relative quantity of the organic acid present. If this solution be now treated with excess of ammonia, it acquires a deep blood-red color, which is permanent, at least for some hours. $\frac{1}{100}$th of a grain of the acid, when treated after this manner, will yield a deep blood-red coloration; $\frac{1}{1000}$th grain yields a similar coloration. The $\frac{1}{10,000}$th of a grain of the acid yields, under the action of nitric acid, a well-marked yellow coloration, which under the action of ammonia assumes a pale-red hue. The nitric acid solution of even the $\frac{1}{50,000}$th of a grain of the organic acid acquires, when treated with ammonia, a distinct reddish coloration. The production of this red coloration is highly characteristic of the organic acid.

Sulphuric acid dissolves the organic acid, as also most of its salts, under the production of a yellow color, to a brown or reddish-brown solution, which, upon the application of a moderate heat, acquires a dark chocolate color. The addition of bichromate of potash to a sulphuric acid solution of the organic acid, causes no striking change.

Hydrochloric acid has little or no action upon the organic acid.

Caustic Potash, Soda or Ammonia, when added to gelseminic acid, causes it to assume an intense yellow color, and quickly dis-

solves it, in the form of a salt, to a solution having very striking fluorescent properties, even when very highly diluted. A solution of this kind containing $\frac{1}{100}$ of its weight of the acid, when examined in a small glass tube by transmitted light, has a strong yellow color; under reflected light, a deep bluish appearance; and under a cone of sun-light condensed upon it with an ordinary hand lens, an intense blue color along the path of the condensed rays.

When the solution contains $\frac{1}{1000}$th of its weight of the acid, it presents, under transmitted light, a greenish-yellow appearance, the surface of the liquid at the same time appearing of a deep blue color; by reflected light, it presents a strong greenish-blue, and under condensed light, a deep blue coloration.

A 10,000th solution of the acid presents, under transmitted light, only a faint yellowish hue, with a blue surface; but under reflected light it appears of a deep blue color, even more intense than a 1000th solution.

A 100,000th solution is colorless, or at most presents only a faint bluish hue under transmitted light; under reflected sun-light, however, it presents a strongly marked blue appearance; and when examined by condensed sun-light, the path of the condensed beam, as it passes through the solution, presents a deep blue appearance. This blue coloration is also observed by looking down the tube containing the solution upon the surface of the liquid. Even one grain of such a solution, when contained in the end of a pipette and examined under condensed sun-light, exhibits a very distinct blue appearance.

Solutions more dilute than the last mentioned appear nearly or altogether colorless under transmitted and reflected light; but even a single drop of a solution containing only the $\frac{1}{1,000,000}$th part of its weight of the acid, when contained in the end of a pipette and examined under a cone of condensed sun-light, presents a quite perceptible blue coloration along the path of the condensed rays.

If a large test tube, or any similar vessel, nearly filled with water, be placed against a black ground in direct sun-light, and view obliquely from the front, and then a drop of an alkaline solution of the organic acid be dropped into the tube, a very

beautiful deep blue coloration will manifest itself along the path of the drop as it slowly diffuses itself through the water, especially if the diffusion be observed under a cone of condensed sun-light. A single drop of a 10,000th solution of the acid, when examined in this manner, yields an intense blue coloration along the path of the alkaline liquid. Even a drop of a 100,000th solution gives rise to a very satisfactory blue coloration.

The commercial fluid extract of gelsemium, when rendered alkaline and diluted with water, presents appearances, in regard to color, similar to those above described, even if the extract be largely diluted. Thus, if the extract be rendered alkaline, and diluted with one hundred parts of water, the mixture presents a strongly marked blue appearance when examined by looking into the tube containing the mixture. Even when diluted with one thousand parts of water, it still presents, under condensed light, a very distinct blue coloration, even if only a few drops of the mixture be examined.

In respect to the manifestation of a blue appearance under the action of light, solutions of gelseminic acid resemble somewhat those of quinine, with, however, this marked difference, that in the case of the latter substance the coloration is only observed when the solution has an acid reaction, whereas in the case of gelseminic acid the coloration manifests itself only in the presence of an alkali, the bluish appearance immediately disappearing on the addition of an excess of an acid.

When cautiously heated upon platinum foil, pure gelseminic acid fuses to a colorless liquid, which, as the heat is increased, darkens in color, gives off white fumes and is finally dissipated without residue.

If a small quantity of the crystallized acid be placed within a glass ring which is attached to a glass slide, and the latter be gradually heated on an iron plate placed over a Bunsen burner, the acid undergoes no change until heated considerably above 212° F., when it volatilizes without fusion or change of color. If the vapors thus produced be received upon a warmed glass slide or cover placed upon the glass ring, they condense in the form of brilliant, transparent crystals of one or more of the

forms illustrated in plate, figs. 3, 4 and 5, their exact character depending on the relative amount of substance present and the temperature employed. For the success of this experiment it is necessary that only a very minute quantity of the organic acid be employed. The $\frac{1}{100}$th of a grain of the acid will furnish quite a number of fine crystalline sublimates. Very satisfactory sublimates may be obtained from the acid, even when contaminated with comparatively large quantities of foreign organic matter.

The true nature of the gelseminic acid sublimate may be established by treating it with a drop of water containing a trace of ammonia, when it will dissolve to a solution having the optical properties already described. So, also, its nature may be determined by dissolving it in a small drop of nitric acid and then adding to the yellow solution an excess of ammonia, when a deep or orange-red coloration will manifest itself.

Reactions of Solutions of Gelseminic Acid.—Solutions of the salts of gelseminic acid have a slightly astringent taste and are colorless, excepting an alkali be present, when, as already pointed out, they present a bluish appearance. They are readily decomposed by free acids, with the elimination of the organic acid, which, if the solution contains $\frac{1}{500}$th or more of its weight of the acid, separates in the form of delicate crystalline needles.

Since the gelseminates of the metals proper are nearly all insoluble in water, the acid is precipitated, from its combinations with an alkali, by solutions of most of the metallic salts, being thrown down in the form of a salt.

1. *Acetate of Lead* throws down from solutions of the acid a yellow amorphous precipitate, which is readily soluble in free acids, even in acetic acid, with the separation of the organic acid. $\frac{1}{100}$th of a grain of the acid in one grain of water, yields with the reagents a very copious deposit; $\frac{1}{1000}$th grain gives a very decided precipitate.

2. *Corrosive Sublimate* produces in solution of the acid a yellowish filmy precipitate. After a little time, at least when from tolerably strong solutions, the precipitate becomes partly, at least, converted into colorless crystalline needles, plate, fig. 6, due perhaps to the separation of the organic acid. The pre-

cipitate is readily soluble in free acids, and its nature may be confirmed by addition of excess of nitric acid and then of ammonia.

Nitrate of Suboxide of Mercury also precipitates the acid in the form of a dirty yellow deposit.

3. *Nitrate of Silver* produces in solution of the acid a yellow or brownish-yellow precipitate, which slowly acquires a nearly or altogether black color and is then insoluble in nitric acid. The 1-100th of a grain of the acid yields a very copious precipitate. 1-1000th grain yields at first only a faint turbidity, but in a little time there is a quite copious black or bluish-black precipitate. 1-10,000th grain will yield after some minutes a good black deposit; and after several minutes, one drop of a 50-000th solution of the acid will acquire a distinct purplish or blackish color.

4. *Sulphate of Copper* throws down from tolerably strong solutions of the acid a brownish-red precipitate, which quickly acquires a dull red color, and after a time becomes partly granular and crystalline. The precipitate is readily decomposed by free acids with the elimination of the organic acid.

5. *Sulphate of Iron* produces in solutions of the acid, when not too dilute, a black precipitate which quickly becomes brown, and after a time masses of colorless crystalline needles appear.

6. *Chloride of Gold* occasions a deep green precipitate, quickly becoming bluish and appearing black by reflected light. The precipitate is insoluble in acetic acid. 1-1000th of a grain of the acid yields a good bluish deposit.

7. *Bichloride of Platinum* produces, in strong solutions of the acid, a dirty yellow amorphous precipitate, which is insoluble in acetic acid, and after a time becomes granular.

8. A solution of *bromine in bromohydric acid* throws down from a drop of a 100th solution of the acid a copious greenish precipitate, which quickly acquires a bluish, then a dark grey color. One drop of a 1,000th solution yields a decided green precipitate, which finally acquires a deep blue color.

9. *Iodine* in solution of *Iodide of Potassium* produces in solutions of the acid, when not very dilute, a copious reddish-

brown deposit, which after a time assumes a dark green color. The precipitate is insoluble in acetic acid.

Solutions containing more than 1-100th of their weight of the acid will also yield precipitates with the soluble neutral salts of lime, nickel, cobalt and tin.

II. Gelseminine.

Preparation.—Gelseminine may be extracted from the concentrated extract from which gelseminic acid has been extracted by ether, by rendering the liquid slightly alkaline with potash, and then repeatedly agitating it with chloroform, which will dissolve the alkaloid together with more or less foreign matter. For this purpose, about two volumes of chloroform may at first be employed, and after this has been separated, the operation repeated with a similar quantity of the fluid, when finally the alkaline solution is washed with about its own volume of the liquid. It sometimes happen, especially if the mixture has been violently agitated for some minutes, that the liquids form an emulsion from which the chloroform does not entirely separate for many hours. The separation may usually be facilitated by moderately warming the mixture and gently agitating it.

The chloroform employed for these extractions is collected in a dish and evaporated at a very moderate temperature, when it will leave a hard, gum-like, yellowish or brownish-yellow residue. This is treated with a small quantity of water and the mixture slightly acidulated with hydrochloric acid, which will dissolve the alkaloid together with more or less foreign matter. This solution is filtered, and the filtrate concentrated to about one-sixteenth the volume of the original fluid extract operated upon. On now treating the concentrated liquid with slight excess of caustic potash, the alkaloid will be precipitated in the form of a more or less white deposit. This is collected on a filter, washed with a small quantity of pure water, then allowed to dry at the ordinary temperature. On drying, the precipitate will shrink greatly in volume and acquire a dark color.

For the purpose of further purifying the alkaloid, the dry mass is pulverized and the brownish powder dissolved, by the aid of a few drops of hydrochloric acid, in a small quantity of

water, from which it is re-precipitated by slight excess of caustic potash and then extracted from the mixture by ether, which, on spontaneous evaporation, will leave it in the form of a very hard, brittle, transparent mass, strongly adhering to the watch-glass or other vessel in which the evaporation was effected. On carefully detaching the residue and pulverising it, it will form a nearly or altogether colorless powder. If the powder is still colored, it may be again dissolved and extracted by ether.

Since the alkaloid is not altogether insoluble in water, a very notable quantity will remain in the filtrate from which the precipitate produced by potash was separated. This may be recovered by precipitating it with a solution of iodine in iodide of potassium, collecting and washing the precipitate, then dissolving it in alcohol, and precipitating the iodine by the cautious addition of nitrate of silver, which will throw it down as iodide of silver, whilst the alkaloid will remain in solution in the form of nitrate. The solution is then concentrated to expel the alcohol, diluted with water, filtered, and the filtrate evaporated at a moderate temperature, when the nitrate will be left in its pure state. The alkaloid may readily be recovered from the nitrate by dissolving it in water, adding slight excess of a free alkali, and then extracting the liberated base by ether or chloroform.

Instead of employing the foregoing method for the recovery of the alkaloid from the above filtrate, the liquid may be slightly acidulated, then concentrated to a small volume, again rendered alkaline, and the alkaloid extracted directly by ether. To obtain it pure by this method, however, will require at least a second extraction with ether.

In regard to the proportion of the alkaloid present in the fluid extract of gelsemium, we obtained, as the average of several experiments, about 3·20 grains of the purified base from eight fluid ounces of the extract examined. Since a fluid ounce of the extract weighs about 450 grains, it would thus appear that it contains about 1-1100th of its weight of the alkaloid, or about one grain in two and a half fluid ounces. Doubtless a notable quantity of the base was lost in the repeated purifications. That the extract as found in commerce is uniform in strength, we are not prepared to state.

Physiological effects.—That this alkaloid is a very active and powerful poison, is shown by the following experiments. One-tenth of a grain, in the form of chloride and dissolved in a small quantity of water, was administered to a strong healthy cat. Immediately it caused extreme frothing from the mouth, and in twenty minutes the animal exhibited great weakness of the extremities, walking with much uncertainty. In forty minutes there was extreme prostration with entire inability to walk and the uttering of plaintive cries. In one hour the prostration was even more complete. When seen six hours after the poison had been administered, the animal appeared comparatively well, but walked with a very uncertain gait. There is little doubt but more or less of the poison was expelled from the mouth by the excessive frothing.

Three days afterwards one-eighth of a grain was administered to the same animal by hypodermic injection, the animal in the meantime having apparently entirely recovered from the former dose, and being well fed. In about fifteen minutes the animal exhibited great distress, manifested by sudden changes of position, moaning, etc. In forty minutes there was great prostration and great difficulty in moving, the legs giving way, and progression being about as often backwards as forwards; the pulse was 230, and very feeble; respiration greatly reduced and gasping; the pupils dilated to their fullest extent. These symptoms continued, and death took place in one hour and a half after the poison had been administered, without there being at any time convulsions.

Chemical properties.—In its pure state, gelseminine is a colorless, odorless solid, having an intensely persistent bitter taste. Thus far we have failed to obtain it in the form of well-defined crystals. It has strongly basic properties, completely neutralising the most powerful acids, forming salts, of which the sulphate, nitrate, chloride and acetate are freely soluble in water.*

In its free state, the alkaloid is only sparingly soluble in water, requiring several hundred times its weight for solution;

* We have not yet satisfactorily determined the ultimate composition of gelseminine, but hope soon to report its exact composition, together with that of gelseminic acid.

but it is very freely soluble both in chloroform and in ether; one part of the alkaloid immediately enters into solution when agitated with twenty-five parts of the latter liquid.

If a drop of *concentrated sulphuric acid* be added to a small quantity of gelseminine, or of any of its colorless salts, it causes it to assume a reddish-brown color, and dissolves it to a reddish-colored solution. If this solution be *moderately heated*, it acquires a beautiful purple color. This coloration manifests itself from 1-100th of a grain of the alkaloid. Bichromate of potash stirred in the sulphuric acid solution of the base, produces no marked change.

Nitric acid readily dissolves the alkaloid, under the production of a greenish color, to a greenish or greenish-yellow solution.

Hydrochloric acid dissolves it with a yellow coloration to a colorless or faintly yellow solution.

Caustic potash has little or no effect upon the dry powder.

At a temperature somewhat below 212° F., gelseminine fuses to a colorless viscid liquid, which on cooling solidifies to a transparent vitreous mass. At a higher temperature the alkaloid is dissipated, without residue, in the form of white fumes. If these vapors be received on a warmed piece of glass, they condense in the form of minute drops.

Reactions of solutions of gelseminine.—Solutions of the salts of gelseminine, when pure, are nearly or altogether colorless, and have the peculiar bitter taste of the alkaloid. This bitter taste is well marked in a single drop of a 1000th solution of the base.

1. *Potash*, as well as the other caustic alkalies, precipitates the alkaloid from tolerably strong solutions of its salts, in the form of a white amorphous deposit, which is insoluble in excess of the precipitant. One drop of a 100th solution of the base yields a rather copious flocculent precipitate. After some hours the precipitate acquires a reddish or brick-red color.

2. *Bichromate of potash* throws down from solutions of salts of the alkaloid, when not too dilute, a copious yellow amorphous precipitate, which is slowly soluble in acetic acid.

3. *Carbazotic acid* produces a yellow amorphous precipitate. 1-100th of a grain of the alkaloid, in one grain of fluid, yields a very copious, bright yellow deposit; 1-1000th grain yields a greenish-yellow deposit.

4. *Iodine* in a solution of *iodide of potassium* throws down from solutions of salts of the alkaloid a brown precipitate, which is only sparingly soluble in acetic acid. 1-100th of a grain yields a very copious precipitate; 1-1000th of a grain, a good chocolate-colored deposit; 1-10,000 of a grain, a very distinct deposit.

5. *Bromine* in *bromohydric acid* precipitates the alkaloid from solutions of its salts in the form of a yellowish amorphous deposit. 1-100th of a grain in one grain of water yields a copious flesh-colored precipitate, which becomes yellow. 1-1000th grain yields a very good yellow flocculent deposit; 1-5000 grain, a very distinct precipitate.

6. *Chloride of gold* produces a yellow amorphous precipitate, which dissolves with difficulty in acetic acid. 1-100th of a grain yields a very copious precipitate; 1-1000th grain yields a good flocculent deposit.

7. *Bichloride of platinum* occasions a light yellow precipitate, which still manifests itself in one grain of a 1-1000th solution.

8. *Sulphocyanide of potassium* produces, in tolerably strong solutions of the chloride of the alkaloid, a dirty-white precipitate, in which, after a time, brownish or chocolate-colored flakes usually appear.

9. *Ferricyanide of potassium* throws down from concentrated solutions of the chloride a dirty-greenish or bluish-green precipitate, the green color of which after a time becomes more marked.

10. *Corrosive sublimate* occasions a white precipitate, which is only sparingly soluble in large excess of hydrochloric acid. 1-100th of a grain yields a very copious precipitate; 1-500th grain, a quite distinct turbidity.

Concentrated solutions of the salts of the alkaloid also yield precipitates, of a dirty-white color, with iodide of potassium and with ferrocyanide of potassium.

From the above it will be observed that the reactions of gelseminine are by no means so characteristic nor delicate as those of gelseminic acid. In poisoning by the fluid extract of gelsemium it might therefore happen that the acid would be discovered, whilst there would be a failure to satisfactorily prove the presence of the base.

III. Case of Poisoning by Fluid Extract Gelsemium.

Symptoms.—In regard to the case of poisoning by this substance, heretofore mentioned, the particulars, as we understand them, were briefly as follows. On the 30th of January last, three teaspoonfuls of the fluid extract were administered to a young healthy married woman several weeks advanced in pregnancy, who at the time complained of no serious illness. In two hours after taking the dose, the patient complained of pain in the stomach, nausea, and dimness of vision. These symptoms were soon succeeded with great restlessness, ineffectual efforts to vomit, and free prespiration over the body. At the expiration of about five hours the pulse was found feeble, irregular, and sometimes intermittent; there was great prostration, with irregular breathing and slow respiration. The skin was dry; extremities cold; the pupils expanded and insensible to light; the eyes fixed and inability to raise the eye-lids. The vital powers rapidly gave way, and, without convulsions, death occurred in about seven hours and a half after the poison had been taken.

It will be observed that in this case, only three teaspoonsful of the fluid extract were taken. Presuming it to have had about the same strength as the preparation we examined, the quantity of the alkaloid contained in this amount could not have much exceeded the sixth-part of a grain. This would seem to indicate the alkaloid to be one of the most potent poisons at present known.

Post-Mortem Appearances.—Eight days after death the body presented the following appearances, as described by Dr. J. H. Stephenson, who made the autopsy and to whom I am indebted for the account. Countenance natural as in sleep. No emaciation, and body in a perfect state of preservation. Cadaveric rigidity very slight. The back of the neck and between the shoulders, extending the full length of the spine, as also the depending parts of the thighs and arms to the elbows, presented a congested appearance. The membranes and substances of the brain and medulla oblongata were normal. The adipose tissue remarkably thick, and highly tinged throughout with bilious matter. Lungs slightly collapsed, natural in appearance, and

superficial veins congested. Heart normal in size, superficial veins injected, and the cavities greatly distended with dark grumous blood, inside of which was found a well-defined membrane, identical in appearance with that found in diphtheria and pseudo-membranous croup. The abdomen presented no tympanitic distention. Stomach slightly distended with gas, and contained a small quantity of ingesta. Peritoneum and intestines in a healthy condition. Liver and investing membrane normal; left kidney congested. The uterus was slightly enlarged and contained a fœtus of about five weeks' development.

A small quantity of the contents of the stomach having escaped from the organ at the time of the dissection, was collected separately in a small bottle; the stomach with the balance of its contents was placed in a larger bottle. These bottles, with their contents, were carefully sealed and remained undisturbed until the 17th of May. At this time the contents of the bottle containing the stomach were found to have undergone considerable decomposition. A little pure alcohol was added to the decomposing mass, and it then allowed to remain until the 13th of June, when the chemical examination of the contents of both bottles was commenced.

Chemical Analysis.—The contents of the *small bottle*, consisting of about two fluid drachms of liquid with a small amount of solid matter, were digested with about one ounce of strong alcohol, the liquid then decanted, and the solids washed with fresh alcohol, which was collected with that first employed. The alcoholic liquid was now concentrated at a moderate temperature to about one-half its volume, then filtered, and the filtrate concentrated to about one drachm of fluid. This concentration caused the separation of some oily globules, and also of some apparently vegetable solid matter, and the mixture exhaled a very marked vegetable odor, very similar to that of the extract of gelsemium under similar conditions.

The concentrated liquid thus obtained was again treated with alcohol, filtered, and the concentrated filtrate treated with about half an ounce of pure water, which left considerable matter undissolved, and furnished, when filtered, a clear slightly yellowish solution. This aqueous solution was concentrated to a small

volume, filtered, the filtrate acidulated with a few drops of acetic acid and then extracted with two volumes of pure commercial ether. On allowing the ethereal liquid to evaporate spontaneously, it left a nearly colorless residue containing several groups of crystals, similar in appearance to those of gelseminic acid.

A portion of this residue, when examined in its solid state by nitric acid and ammonia, and another portion when dissolved by the aid of an alkali and the solution tested by several reagents, presented the chemical and fluorescent properties of gelseminic acid in a degree indicating the presence of a very notable quantity of the acid. The contents of the small bottle were not examined for the alkaloid.

The contents of the *stomach* were treated and purified after the general method described above, and the final aqueous solution acidulated with acetic acid and extracted with ether, for the purpose of recovering the organic acid, if present; the solution thus extracted was then rendered slightly alkaline and extracted by chloroform, for the purpose of recovering the alkaloid. The purified ether extract revealed very satisfactory evidence of the presence of the organic acid, both in regard to its fluorescent and chemical properties. So, also, the chloroform extract, when purified and the final aqueous solution concentrated to a very small volume and examined by several reagents, furnished undoubted evidence of the presence of the base, indicating it, however, to be present only in very minute quantity.

On comparing the intensities of the reactions of the several reagents applied with those obtained by the same reagents from solutions of the alkaloid of known strength, it was inferred that the quantity of the base recovered in this case did not much, if any, exceed the fiftieth-part of a grain. The quantity of the alkaloid originally taken, as we have already seen, did not probably much exceed the sixth of a grain.

The fact that the stomach with its contents had undergone considerable decomposition, and also that the chemical examination was not made until some months after death, would seem to indicate that the poison is not readily destroyed by decomposition, and that it may be recovered after comparatively long periods, even when taken only in small quantity.

COLUMBUS, OHIO, Nov. 15, 1869.